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ABSTRACT

This paper presents an overview of World Wide Web-enabled databases that dynamically generate Web materials and focuses on the use of this technology to support collaboration, knowledge construction, and communication. Database applications have been used in classrooms to support learning activities for over a decade, but, although business and e-commerce have quickly embraced dynamic Web-based databases, their potential in educational environments is just now beginning to be realized. The authors explore a social constructivist framework for using Web-based databases to support learning and assessment and describe several specific applications of dynamic databases used to facilitate the construction of knowledge and support collaborative activities in online education courses. Several uses of databases are summarized, including building community, potential for continued growth, simplicity and accessibility, empowerment, and quality. The following examples of dynamic databases are described: student pictures and biographies for HyperGroups; computer-based instruction database; and faculty feedback. (Contains 13 references.) (MES)

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Facilitating Collaboration, Knowledge Construction and Communication with Web-Enabled Databases

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Abstract: This paper presents an overview of Web-enabled databases that dynamically generate Web materials and focuses on the use of this technology used to support collaboration, knowledge construction and communication. Database applications have been used in classrooms to support learning activities for over a decade, but, although business and e-commerce have quickly embraced dynamic Web-based databases, their potential in educational environments is just now beginning to be realized. The authors explore a social constructivist framework for using Web-based databases to support learning and assessment and describe several specific applications of dynamic databases used to facilitate the construction of knowledge and support collaborative activities in online education courses.

In order to build a true electronic community of learners, communication and collaboration among participants should be considered the driving force. Unfortunately, many online courses (as well as many traditional courses) fail to take advantage of the potential for interactions that can add richness and depth to the construction of knowledge. In our online courses, student homework and projects are often similar to a face-to-face classroom; that is, specific assignments are given and students e-mail it to the instructor to be graded. The problem, we have found, is that student work often does not become part of the course materials, and it tends to disappear at the end of the semester. Consequently, students do not always feel that they are creating or adding to a body of knowledge and information for the course, nor do they experience ownership of the content.

Constructivist Frameworks

Learner-centered, constructivist, and sociocultural theories were used to inform the design, development, assessment and research on Web-enabled database technologies. Our goal is to increase our understanding of the effects of dynamic technologies on student interactions, motivation, empowerment and engagement. Vygotsky's (1978) sociocultural learning theory suggests that learning occurs as learners interact with peers and provides an understanding of learning as a process of social negotiation. The teacher is a co-participant in the learning process and a facilitator in the student's construction of knowledge. Researchers point out that instruction should take place in an environment in which learners use socially mediated and intellectual tools to achieve cognitive development (Rogoff, 1990; Salomon, 1993)

Riel (1998) notes that in the group settings of schools, it is difficult to facilitate engaged learning. She suggests that the majority of time is spent preparing students to learn by delivering information in carefully regulated conceptual units. Students are then responsible for organizing this information in a way that will facilitate easy retrieval at the correct time. Riel suggests that teachers can play a role in providing strategies and tools for creating "intellectual order" (p. xviii). Constructivists favor student-centered methods that support both personal independence and relatedness to the entire group or community. Knowledge construction is a communal enterprise, and the motivation to learn cannot be separated from the social context in which it is embedded. At the same time, constructivists believe that the educational process should nurture each student's own capacity for transformation and self-regulation. Constructivist teaching methods require both collaboration and positive interdependence with other group members and emphasize personal responsibility and individual accountability. (Lebow, 1993). Constructivists support self-regulated learning by promoting skills and attitudes that enable the learner to assume increasing responsibility for the learning itself.

Windschitl (1999) has stated that "constructivism is premised on the belief that learners actively create, interpret, and reorganize knowledge in individual ways." In that vein, we try to create a constructivist environment in our online courses, where students are able to manipulate the content of the course to fit their specific learning needs or goals. To

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do this, they must interact with the information they are researching and writing about, and they must share their views with the other students in the course, not just with the instructor. In a typical online course in our program area, there may be several hundred postings to the class listserv during the semester. Our efforts, therefore, have been toward having students not only interact with their own small number of postings, but use the virtual environment to explore, analyze, discuss, and debate issues and topics that cover the broad spectrum of information that arises during the course.

Dynamic Databases

Most Web pages, including the course pages that we have been developing for several years, are static and do not take advantage of the interactivity offered by the Web. Most Web pages simply duplicate print-based materials in electronic form. Simply converting existing course information to online format is not enough to effectively produce meaningful Web-based courses. Online course developers must focus on creating courses that are more responsive to students and student needs, facilitating social and instructional interactions, creating a sense of a learning community, and delivering timely and useful information. Creative strategies are needed that utilize innovative tools such as Web database tools are needed.

How a Dynamic Database Works

The integration of Web pages and dynamic database technologies allows users to access a database through a Web page and to dynamically generate Web pages that present the requested data. The variable data on the Web page is generated from the database and delivered to the user through a template page. All of the usual abilities of a database, such as searching for information, doing calculations, entering new information, and editing existing information, are available through the Web browser. This means that any application that can be created using a database can be made available on the Web.

Uses of Databases

Databases are used to facilitate the construction of knowledge and support collaborative activities in online education courses. Students submit assignments for class through an online form that stores the information in a database. Students can check assignment status, grades, and feedback from instructor by logging on to the dynamic site with a username and password. The database may also be used to share assignment submissions with other students. In another instance, student pictures in a database may be automatically added to postings in discussion lists.

Building Community
A database helps builds electronic communities and may encourage students to feel like they belong to a community through shared knowledge. Students may share work with classmates. Pictures of students which come up automatically when posting help students feel less isolated by providing a person to look at when reading the posting.

Potential for Continued Growth
Student work may be easily archived and can be useful over many semesters. Assignments that are already in database provide an example for students who have questions or need more support. The database can expand and evolve easily by building on prior materials. The body of knowledge is not static but continues to change without requiring extra work on the part of the faculty member.

Simplicity and Accessibility
Databases are convenient and simple to use. Students don't need a high level of technical skills in order to be successful. Users do not need to have technology skills to add, revise, or use material in a database since it is driven through forms and search queries. This is particularly important for new or inexperienced users. Even simple forms can be used to collect data and then it may be inserted into a pre-designed template that is always available and accessible from anywhere. Because the database information has the potential to be accessed from anywhere in the world with an Internet connection and a Web browser, data can be expanded, updated or deleted easily. The capabilities to search the database are an important consideration.

Empowerment
Students may feel empowered because there is immediate feedback on whether submission was successful. Students can check assignment status, grades, and feedback from instructor. This may result in increased interest, engagement, and personal responsibility. There is ownership of the material since the content is collective and not instructor-driven. There is increased interaction between students and the resources. This interactivity implies involvement and commitment, since it empowers the user to control the environment. Empowering students with control of content may affect participation, motivation and feeling of community. Material may become more interesting and stimulating when learner control increases.

Quality
There may be an increased quality of student work because students can see each other's work. Students may feel that they are creating materials for other classes to follow. Class projects may build on work from previous students.

Examples of Dynamic Databases

Example One: Student Pictures and Biographies for HyperGroups
Students in our online classes use a variety of listservs as a primary means of course communication. To enhance the feeling of an electronic learning community, students pictures are taken at orientation and uploaded to the server. When a student posts a message to the listserv through a form that gathers their e-mail address, the message is displayed dynamically with their picture. The student simply has to type in their e-mail address for the picture to appear (See Figure 1).

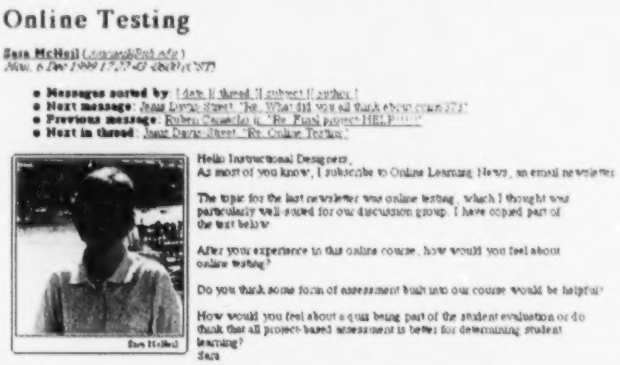
Online Testing
Sara McNeil
Messages sorted by:
Next message:
Previous message:
Next in thread:
Hello Instructional Designers,
As most of you know, I subscribe to Online Learning News, an email newsletter
The topic for the last newsletter was online testing, which I thought was particularly well-suited for our discussion group. I have copied part of the text below
After your experience in this online course, how would you feel about online testing?
Do you think some form of assessment built into our course would be helpful?
How would you feel about a quiz being part of the student evaluation or do think that all project-based assessment is better for determining student learning?
Sara

Figure 1: Participant's Pictures Automatically Generated by E-mail Address

Example Two: Computer-Based Instruction Database
Students in a graduate level instructional design course use the Web database tools to contribute different types of materials. For example, with one assignment, students review an online tutorial and post an evaluation of it using a Web form. They are then able to search the tutorial evaluation database by content area and audience/grade level.

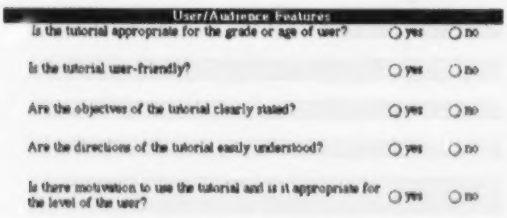

Figure 2: Form Used To Collect Tutorial Evaluation

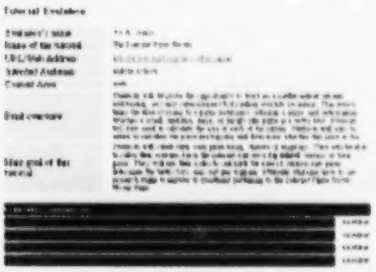

Figure 3: Dynamic HTML Page Generated From Database

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Perhaps the most interesting and creative use of a database is the game design assignment. Students design a computer-based game and submit their description as a newsletter article through a Web form.

Figure 4: Form Used To Collect Game Design Data

Figure 5: Query Form to Select Game by Content, Audience or Author

Figure 4 illustrates the form used to collect data for the sections of the newsletter. Students use text fields, pull-down menus, and radio buttons to submit information about the game they have designed. When the student submits the data, it is automatically sent to the database. Students may then use the query form (See Figure 5) to search the database by content area, audience, or author. The results of the query by content are shown in Figure 6. Figure 7 illustrates the merger of the content from the database with the newsletter template, the HTX file, which is then displayed in the browser as a dynamic HTML file, complete with banners and graphics (See Figure 7).

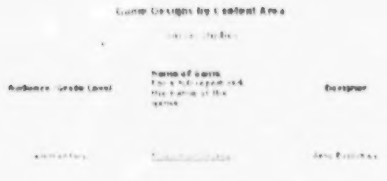

Figure 7: Results of Game Query

Figure 8: Example of Game Design in Newsletter Format

Example Three: Faculty Feedback for Student Assignments

In another online course, submission of student assignments also utilizes the Web database tools. Students are directed to a Web page that contains an online form in which they enter their name, a unique identification number (the last 4 digits of their Social Security number), and the number of the assignment (See Figure 9).

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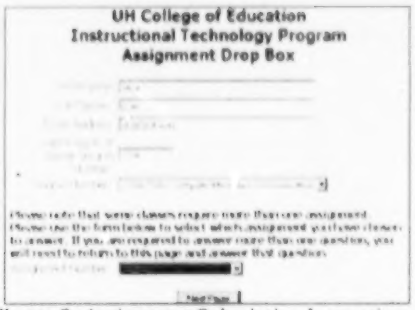

Figure 9: Assignment Submission Instructions

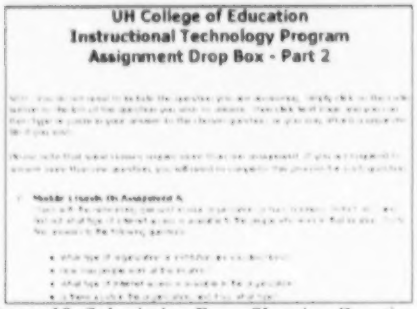

Figure 10: Submission Form Showing Questions

Students are then directed to a page where they select from several choices, which questions they will answer for that week's assignment.

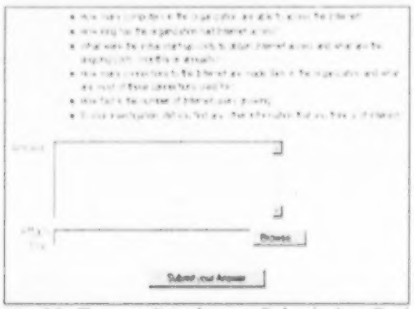

Figure 11: Text or Attachment Submission Options

If they have created a word-processed document, an Excel Spreadsheet document, other formatted document in completing the assignment, an attachment feature may be used. Once the submit button is pressed, the student work is sent to the database and an e-mail confirmation message is automatically sent to the student.

After assignments have been submitted, the instructor uses the Faculty Grading form to provide feedback for the assignments that have been posted (See Figure 12). Since all of the student postings are available in the database, the instructor may review all of a particular student's assignments or all of the other students' postings on a specific assignment, depending on what terms are used to sort and view the database entries.

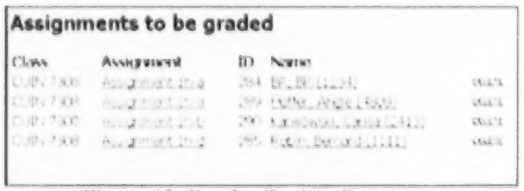

Figure 12: Faculty Grading Form

Figure 13: Student Assignment Feedback Form

Students may also view each other's assignments and their own feedback from the instructor by using the Student Feedback Review form. This page includes the question, the answer, and the feedback and grade from the instructor (See Figure 13).

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Potential for Dynamic Databases in Teaching and Learning

Web-based database tools provide students and faculty with innovative solutions that promote collaboration and the creation of shared knowledge. Lynch (1999) summarizes this by stating, "To educational institutions this technology offers a challenge in using the technology to drive a more innovative and acceptable learning environment than that offered by the static Web pages of previous years. What is required now, is the classroom environment to adapt this technology into every day practice."

The use of dynamic database tools has helped us as we seek to improve our online courses, and they have indeed given students greater control over the information covered in the courses. However, there are some limitations that should be mentioned. First, the technical skills needed to develop and use the dynamic database tools are greater than those needed to create traditional Web sites. Many simple HTML editing tools are available, and converting word-processed files, for example, to static Web pages is a skill that may be mastered very quickly. Conceptualizing how the database tools will function is very different from creating static pages, and a new set of skills must be learned that include a greater understanding of information design and management. The time needed to design, develop, and evaluate online courses that include database tools requires a larger amount of both time and patience than many educators will be able to commit. Certainly, as with other Web-related tools, software improvements will make the job easier, but at this time, a steep learning curve is the rule. Finally, students who are asked to interact with these tools will need some instruction on how to use and access the interactive elements.

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